Newly Published Papers … a profile

The June issue of the Transactions has a Special Section that reflects the current challenges faced by the industry in microscale liquid cooling, thermal interface material development, interface resistance minimization, and stacked die.

I've included Guest Editor John Parry's summarizations below:

Thermal Metrology of Silicon Micro-Structures Using Raman Spectroscopy

As integrated circuit (IC) feature sizes continue to reduce, so the challenge of measuring their temperature increases. Abel et al. used Raman spectroscopy to measure temperature and thermal stress of an electrically active silicon cantilever and polysilicon micro-beams with a resolution of close to 1 m, with results within 10% of the finite element model predictions.

On-Chip Liquid Cooling With Integrated Pump Technology

Oprins et al. introduce an on-chip liquid cooling system for microchannels with integrated pump, using an applied ac signal to cause a droplet to fill and empty a 100- m microchannel. Having found a critical filling period, the authors conclude the proposed novel electrowetting system is promising, enhancing cooling capacity by more than 50%.

A Practical Implementation of Silicon Microchannel Coolers for High Power Chips

Colgan et al. describe the design, fabrication, and testing of a practical implementation of a single-phase silicon microchannel cooler for bonding to high power chips. Being fabricated in silicon it can be rigidly bonded to an active die, for example with solder. The authors demonstrated its ability to cool a 300 Wcm thermal test chip.

Hierarchically Nested Channels for Fast Squeezing Interfaces With Reduced Thermal Resistance

Brunschwiler and co-workers at IBM have found a method to reduce the thermal resistance of thermal interface materials by the use of a hierarchy of grooves cut into one of the surfaces, reducing bond line thickness and dry-out, by allowing the paste or grease to flow under thermal cycling.

Rudimentary Finite Element Thermal Modeling of Platelet-Filled Polymer-Ceramic Composites

To investigate the influence of filler geometry on interface material performance, Hill and Strader have modeled polymers loaded with platelet-shaped titanium diboride and boron nitride fillers, providing insight into the observed behavior of these materials, which exhibit a sharp increase in thermal conductivity as their volume fraction is increased.

You may quickly access these 5 papers, and others from the June 2007 issue, at:

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